



ATOMIC OXYGEN SIMULATION FACILITIES

Purpose:

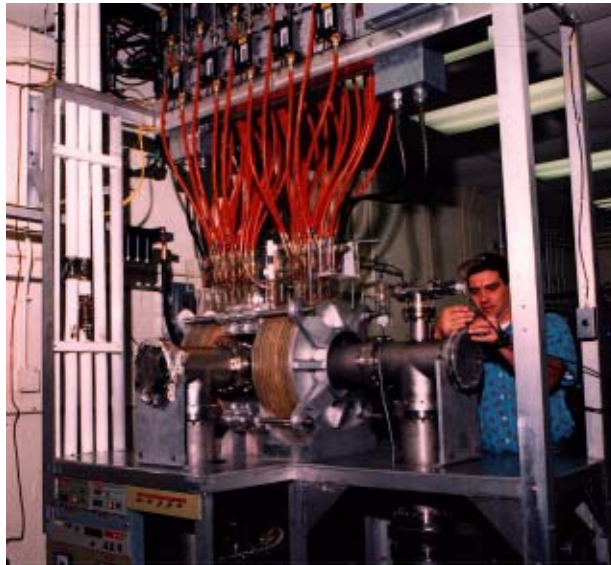
To evaluate the effects of atomic energy on materials to be used in space applications.

MSFC has developed and implemented orbital atomic oxygen simulation facilities based on the physical characteristics of a low earth orbit environment. This capability is used to determine the long term exposure characteristics of objects launched into space.

MSFC employs three methods for achieving the generation of atomic oxygen to stimulate orbital conditions: (1) thermal plasma ashers; (2) out-of-field atomic oxygen drift tube simulators; and (3) 5 eV neutral via the Atomic Oxygen Beam Facility. Each method generates atomic oxygen plasma on the surface of the material under test. The radiation within the plasma represents the spectral line of atomic oxygen. By measuring the magnitude of the spectral line intensity, MSFC can calculate a relative figure-of-merit that is proportional to the strength of interaction between the atomic oxygen and the test material. Each method has different strengths and weaknesses based on cost, safety, purity of the atomic oxygen in the plasma, and the sample's heating characteristics. MSFC's current atomic testing activities involve materials qualification for anodized and alodine aluminum and nickel; KYNAR shrink tubing; apliz; super beta; labels; O-rings; slidewire; targets and teflon overcoats as well as for ProSEDs and NASA/Jet Propulsion Laboratory's flight experiments.

Future activities include continued support for ISS and advanced propulsion systems.

MSFC's orbital oxygen simulation facilities provide a robust means for simulating orbital atomic oxygen in a low earth environment. The Center performs this service for NASA missions as well as vendors and contractors. This unique capability enables the space industry to determine the long term exposure characteristics of objects launched into space.

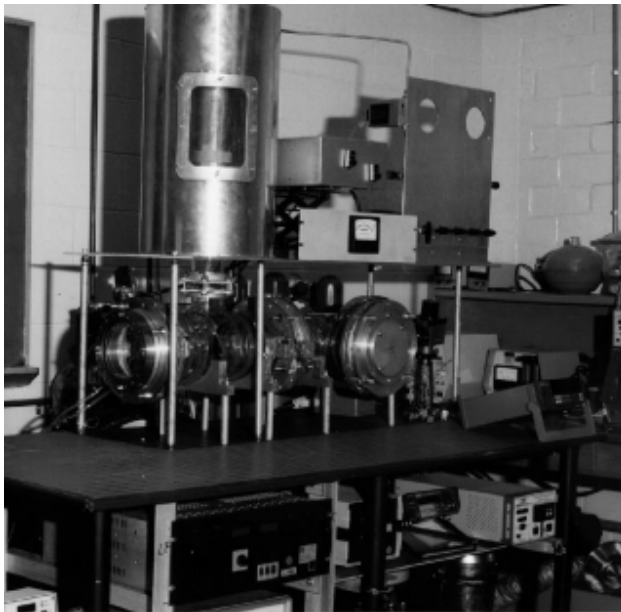




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Atomic Oxygen Drift Tube System

The Atomic Oxygen Drift Tube System generates an atomic oxygen plasma by a 14.7 MHz r-f field, producing up to 5×10^{16} atoms/cm²/sec neutral oxygen atoms of <0.1 eV thermal energy. The samples are exposed outside the r-f field to reduce heating. Near UV or vacuum UV radiation can be added. This facility is located in Building 4711.



Atomic Oxygen Beam Facility

The Atomic Oxygen Beam Facility (AOBF) generates plasma by a 2.45 GHz, 2kW r-f Field which is confined by a 4 Kgauss magnetic field to increase the flux. Any ions are neutralized by collision with a metal plane. The AOBF is tunable from 3 eV to 20 eV energy and can produce an atomic oxygen flux up to 10^{16} atoms/cm²/sec with a 5% duty cycle. This facility is located in Building 4711.

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